N 536 - Utilization of Nursing Research in Advanced Practice, Summer 2008

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Research Design

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Design Characteristics

- Maximizes control over factors to increase the validity of the findings
- Guides the researcher in planning and implementing a study
Level of Control: Quantitative Research

- Descriptive
- Correlational
- Quasi-experimental
- Experimental

Increased Control with Design
Concepts Relevant to Research Design (1)

Causality

A \[\rightarrow\] B
Pressure \[\rightarrow\] Ulcer

Multicausality

Years smoking \[\rightarrow\] Heart disease
High fat diet \[\rightarrow\] Heart disease
Limited exercise \[\rightarrow\] Heart disease
Concepts Relevant to Research Design (2)

- Probability: Likelihood of an outcome
- Bias: Slanting findings
- Manipulation: Treatment
- Control: All phases of design
Design Validity

- Measure of accuracy of a study

- Examined with critique of the following dimensions:
  - Statistical conclusion validity
  - Internal validity
  - Construct validity
  - External validity
Elements of a Strong Research Design (1)

- Controlling the environment of the study setting

- Levels of controlling:
  - Natural setting
  - Partially controlled setting: e.g., clinics
  - Highly controlled setting: e.g., laboratory
Elements of a Strong Research Design (2)

- Controlling the equivalence of subjects and groups
  - Random subject selection
  - Random assignment to groups
Elements of a Strong Research Design (3)

- Controlling the treatment
  - Choose a treatment based on research and practice
  - Develop a protocol for implementation
  - Document the implemented treatment
  - Use a check-list to determine the extent of completeness to which the treatment was implemented
  - Evaluate the treatment during the study
Elements of a Strong Research Design (4)

- Controlling measurement
  - Reliability
  - Validity
  - Number of measurement methods
  - Types of instruments
Elements of a Strong Research Design (5)

- Controlling extraneous variables
  - Identify and eliminate extraneous variables via sample criteria, choice of settings, or research design
  - Random sampling
  - Sample: Heterogenous, homogeneous, or matching
  - Statistical control
Problems with Study Designs

- Inappropriate for the study purpose or the research framework
- Poorly developed designs
- The research methods were poorly implemented
- Inadequate treatment, sample, or measurement methods
Selecting a Design

Is there a treatment?

Yes

Is the treatment tightly controlled by the researcher?

No

Yes

Is the primary purpose examination of relationships?

No

Yes

Descriptive Design

Will the sample be studied as a single group?

No

Yes

Quasi-Experimental Study

Will a randomly assigned control group be used?

No

Yes

Is the original sample randomly selected?

No

Yes

Experimental Study

Correlational Design
A Typical Descriptive Design

Clarification → Measurement → Description → Interpretation

Phenomenon of Interest

Variable 1 → Description of Variable 1
Variable 2 → Description of Variable 2
Variable 3 → Description of Variable 3
Variable 4 → Description of Variable 4

Interpretation of Meaning

Development of Hypotheses
A Comparative Descriptive Design

Group I {variables measured} → Describe → Comparison of Groups on Selected Variables → Interpretation of Meaning → Development of Hypotheses

Group II {variables measured} → Describe
Selecting the Type of Correlational Design

- Describe relationships between/among variables?
  - Descriptive correlational design

- Predict relationships between/among variables?
  - Predictive correlational design

- Test theoretically proposed Relationships?
  - Model testing design
A Descriptive Correlational Design

Measurement

Research Variable 1

Description of variable

Interpretation of Meaning

Examination of Relationship

Development of Hypotheses

Research Variable 2

Description of variable
A Predictive Design

Value of Intercept + Value of Independent Variable 1 + Value of Independent Variable 2 = Predicted Value of Dependent Variable
Selecting The Type of Quasi-Experimental Design

- Control Group?
  - No
  - Pretest?
    - No
      - One-group post-test only design
    - Yes
      - Repeated Measures?
        - No
          - Comparison with population values?
            - No
              - Strategy for Comparison
                - No
                  - Suggest Reevaluating design
                - Yes
                  - Compare treatment & control conditions?
          - Yes
            - Repeated Measures?
              - No
                - One group pretest/post-test design
              - Yes

Selecting The Type of Experimental Design

- Pretest
  - No
    - Post-test only control group design
  - Yes
    - Repeated Measurements?
      - No
        - Examine effects of confounding variables?
          - No
            - Multiple sites?
              - Yes
                - Randomized Block Design
              - No
                - Pretest/post-test control group design
        - Yes
          - Blocking?
            - Yes
              - Comparison of multiple levels of treatment
              - Examination of complex relationships among variables in relation to treatment
            - No
              - Randomized clinical trials
  - Yes
    - Repeated measures design
### Pretest-Post Test, Control Group Designs

<table>
<thead>
<tr>
<th></th>
<th>Measurement of dependent variables</th>
<th>Manipulation of independent variables</th>
<th>Measurement of dependent variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Randomly selected</td>
<td>PRETEST</td>
<td>TREATMENT</td>
<td>POST-TEST</td>
</tr>
<tr>
<td>experimental group</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Randomly selected</td>
<td>PRETEST</td>
<td></td>
<td>POST-TEST</td>
</tr>
<tr>
<td>control group</td>
<td></td>
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</tr>
</tbody>
</table>

| Treatment:                | Under control of researcher        |

| Findings:                 | Comparison of pretest and post-test scores |
|                          | Comparison of experimental and control groups |
|                          | Comparison of pretest-post-test differences between samples |

| Uncontrolled threats to validity: | Testing Mortality |
| Instrumentation           | Restricted generalizability as control increases |
Post-Test-Only Control Group Design

<table>
<thead>
<tr>
<th>Randomly selected experimental group</th>
<th>TREATMENT</th>
<th>Randomly selected control group</th>
<th>POST-TEST</th>
</tr>
</thead>
</table>

- **Measurement of independent variables**
- **Measurement of dependent variables**

**Treatment:** Under control of researcher

**Findings:** Comparison of experimental and control groups


**Uncontrolled threats to validity:**
- Instrumentation
- Mortality
- Limited generalizability as control increases
### Nested Design

#### Pain Control Management

<table>
<thead>
<tr>
<th>Traditional care</th>
<th>PRN Medication</th>
<th>New approach: “Around the clock” medication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit A</td>
<td>Unit B</td>
<td>Unit E</td>
</tr>
<tr>
<td>Unit B</td>
<td>Unit C</td>
<td>Unit F</td>
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<tr>
<td>Unit C</td>
<td>Unit D</td>
<td>Unit G</td>
</tr>
<tr>
<td>Unit D</td>
<td></td>
<td>Unit H</td>
</tr>
</tbody>
</table>

#### Primary Nursing Care

<table>
<thead>
<tr>
<th>Primary Care</th>
<th>No Primary Care</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit A</td>
<td>Unit B</td>
</tr>
<tr>
<td>Unit C</td>
<td>Unit D</td>
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Advantages of Experimental Designs

- More controls in design and conducting a study
- Increased internally validity
  - Decreased threats to design validity
- Fewer rival hypotheses
Advantages of Quasi-Experimental Designs

- More practical
  - Ease of implementation
- More feasible
  - Resources, subjects, time, setting
- More generalizable
  - Comparable to practice
Developing the Design Section of Your Proposal

- Identify the design
  - Name it specifically

- Provide a map of the design
- Discuss your rationale for using this design
- Describe threats to the validity of the chosen design